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The high-tech return of high school shop class

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(CNN) - You can almost hear the old shop teacher asking - *so, how is this going to work?*

In his State of the Union speech, President Barack Obama talked about redesigning schools for a high-tech future. He gave a shout-out to a technical high school in Brooklyn, and to 3-D printing. In a moment of seeming agreement, Republican Sen. Marco Rubio mentioned incentives for schools to add vocational and career training.

But long gone are the days of shop class, or even "vocational training," said Stephen DeWitt, the senior director of public policy for the Association for Career and Technical Education. For many years, he saw career and technical education cut by shrunken budgets or "literally and figuratively left in the back of the school, separate from academics."

What's emerging in schools now is something tougher to pin down. In one district, it might be a fancy new school dedicated to teaching tech. In another, an apprenticeship program. Some schools design career and technical classes to line up with college-prep courses that guide students to become engineers, chefs, CEOs or doctors. Almost 80% of high school students who concentrated on career and technical studies pursued some type of postsecondary education within two years of finishing high school, the U.S. Department of Education reported in 2011.

"We're hearing policy makers talk about it more often. Certain districts are looking at career and technical education as a way to reform schools," DeWitt said. "The focus on project-based learning, how to get students engaged more, is something that's caught on."

That might mean more maker spaces sprouting up at schools, too.

They are exactly what they sound like - a space to make things. The workshops and warehouses have taken off in communities around the country during the last few years, but the push to add them to schools is still fresh.

"Maker spaces aren't in schools and they need to be," MAKE magazine founder Dale Dougherty told a crowd at Maker Faire in Michigan last summer. "Not just a summer camp, not just an after-school program."

MAKE secured a grant from the Defense Advanced Research Projects Agency to build the "hacker spaces" in schools - a move some criticized because of its military ties. The money helped to launch maker spaces at a handful of Northern California schools this school year. The goal: more than 1,000 by 2015.

Administration, costs, tests - yes, all those things could get in the way of a space dedicated to hands-on learning, Dougherty said. But what educator, what economist, wouldn't want a classroom of engineers, creators and entrepreneurs?

"It's hard, in some ways, to change schools, but I'm not feeling resistance," said Dougherty, who will speak at SXSWedu in March. "A lot of schools have machines from old shop classes. Recover that before it goes to the dump."

That's what happened at Analy High School in Sebastopol, California. Students there took over a room at the nearby headquarters of MAKE magazine to get more hands-on learning, and last fall, they moved into a 3,200-square-foot building on their own campus. For years, the space had sat empty after metal shop and agriculture classes dropped off the curriculum or moved to other spaces. Now, nearly 50 kids are there every day, learning to make LED-lit shoes with built-in GPS, high-tech, steampunk-styled airships, and a "drawbot" that works like an oversized, programmable Etch a Sketch.

In the last few weeks, students designed those projects, created budgets and pitched their ideas to local Rotary Club members, school officials and a MAKE engineer who agreed to fund the best of them. Building will begin soon on the kicks, ship and bot, along with at least three other projects.

The students spent much of the first semester building out the space, but they're already incorporating new tools and technology into their ideas, said Casey Shea, their teacher.

"When they were doing their proposals, how nonchalantly they were like, 'Let's 3-D print that piece,'" said Shea, a math teacher who took on the Project Make class between algebra and pre-calc sections. "It's not magic to them. They're used to seeing crazy things and thinking, 'Yeah, I can do that.'"

CNN checked in with Shea at the start of the school year, and again this semester. Here, he explains how Analy High School's maker space works, and how it has changed the way students learn.

CNN: What kind of equipment do you have?

Shea: We've got the 21st century tools - 3-D printer, vinyl cutter, laser cutter, a hand-me-down from MAKE. We've got the sheet metal tools that were left from the old days. We can bend, cut, spot weld. Basic woodworking hand tools - we have a full wood shop (in the school), so we don't have a lot of that. Then the electronics area is really coming together, oscilloscopes, old test equipment, old motors. I just filled up a truck with stuff an old teacher had from 15 years ago that he was just now finally able to let go.

The vinyl cutter, I got on eBay. It was a starter kit, less than $500. It's the perfect entry into computer-aided design. You allow kids to really come up with their own ideas. You can make stickers, banners, anything you can type or design on a computer. We've made banners for a dance and career day rather than outsource. It's saving money.

The laser cutter is probably the most versatile. It can engrave, cut, make different, cool 3-D things, make 3-D cardboard models. The 3-D printer is probably the most sexy. It's getting all the press. It's a longer journey to be able to design your own things. It's got the glamour, but more sizzle than steak at this point. But it's really cool.

CNN: Did you manage to get a diverse cross-section of the school in the class?

Shea: When I was walking around trying to sell it, I wanted to make sure it wasn't just a room full of geeky boys. I was asking girls in my geometry class, "Could we do this kind of stuff, but make it cooler? What kind of stuff would you want to make?" They were like, "Duh, girls like this stuff, too."

Our percentage of girls this year is lower – a little less gender-distributed, but certainly the academic levels are varied. It's interesting to see how they intermingle. It's rare to have a class of a mix of ages and abilities. I really do think the kids at both ends get something out of having their hands on something, rather than all-theory or a complete void.

CNN: How does it change the way students are learning?

Shea: It's the kids who came in with no experience, no background, no skills who get that sense of accomplishment. Without fail, nothing works the first time. It's something we don't get enough opportunity to do. In most classes, we have to move on, you either get it or you don't. Failure is a judgment rather than part of the process. In math, kids come in convinced, or someone has convinced them, they can't do something. We don't take the time to go back and make that failure a reflective process.

"You failed? That's great, what did you learn?"After you get those little moments of success, "That's great - remember how bad you felt yesterday, after three days of putting the thing together, flipping the switch and it didn't work? It's not over." That's more like real life, rather than school.

CNN: What advice would you give to other schools and teachers that want to start their own maker spaces?

Shea: Start small. Start with an after-school thing. Get this stuff into the mainstream of the school. "We've got this stuff, what do you need?" As an assignment, (the students) have got to make something for a teacher's room. The whole idea is to open eyeballs and start to think creatively.

We've gotten an amazing amount of materials and support from the community. We've had a number of community builders coming in, ex-teachers, tinkerers who are moving, realizing they're not going to get into their electronics stuff. You've got to just dive in, and you've got to know, it's like a tiger by the tail, but it's a great tiger.

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